

# Color Correction for Digital Dermatologic Images

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## INTRODUCTION

Dermatologic diagnosis heavily relies on the clinical and histopathological image. The display of images using correct colors is crucial. Unfortunately different hardware will display images differently if no provisions are made. Further, most users in medicine do not know about the problems like gamma value and chromacities.

## METHODS

For color adjustment we used an image that consists of a red, green, and blue area at medium intensity. The center is displayed dithered, whereas the border is displayed as single color. For example, for a gamma value of 1 the border of the red component may be displayed as (128, 0, 0) and the center as (255, 0, 0) and (0, 0, 0) respectively. When both border and center seem to display the same color, the gamma value has been adjusted to one. As we do not use a gamma value of one, we precorrected the test image to the gamma we used when recording the images offered at our server. Server side gamma correction, conversion, compression, and decompression were done using the portable anymap (PNM) tools. GIF images were used for display of the correction image.

## RESULTS

A forms based user interface was implemented where the user could choose whether the center is brighter or darker than the border for each color and select the corresponding buttons. A new test image was computed on the Web-server using the corresponding values. This process was repeated until there was hardly any difference visible between dithered and plain colors. The computed gamma value is stored for color correction of the images available on our server.

## DISCUSSION

We implemented a simple server based gamma correction, which can be used by every physician without knowing anything about gamma values and colors. Of course, client side configuration is preferable considering the following aspects:

- Images are stored on the Web-server lossy compressed. For gamma correction they have to be decompressed, corrected, and compressed again for transmission over the network. Thus, image

quality is lost.

- Web-servers are heavily loaded. Due to this as much of the computing as possible should be done by the client. The transfer is delayed by any additional operation to be performed by the server.
- A user and computer cannot be identified by the server due to proxies and dynamic allocation of IP-addresses. Thus, the configuration process may be necessary repeatedly.

Gamma correction seems to be the most important aspect of color correction in the Web, as the eye seems to be able to adjust to the whitepoint, of course, only in a certain range. In Dermatology a low color temperature seems to have advantages as red-dish images looked more natural to our physicians. The primary values of red, green, and blue are not very important because saturated colors are hardly used.

Portable Network Graphics<sup>1</sup> (PNG) offers support for gamma values, chromacities, and a lot of other useful things. However, because PNG compresses lossless, it is not acceptable for our applications<sup>2</sup> in the WWW.

## CONCLUSION

The server based gamma correction can be used by every physician without knowing anything about gamma values and colors. Of course, client side configuration is preferable. A JAVA script will be developed for this purpose.

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## References

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